Optimization and Field Testing of a Low-cost Portable Enterococci Test (PET) Kit

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The United Nations estimates that 2.5 billion people worldwide are living without access to clean water with over 2 million dying each year from waterborne disease. Continual exposure to unclean water may cause long term effects such as malnutrition through repeated bouts of diseases attributed to the unsafe water. Governments in remote areas often treat illnesses rather than establish testing criteria and implementation of plans to reverse the poor environmental conditions. Elevated levels of fecal indicator bacteria in aquatic environments are linked to an increased risk of exposure to enteric pathogens. Growing populations and a lack of government infrastructure further necessitate the need for a readily available, low-cost, method specific test to determine water quality in many countries. A prototype test kit following current USEPA Method 1600 for membrane filtration to detect enterococci was developed in 2014; subsequent redesign in 2015, incorporating multi-disciplinary modalities has continued to increase its capabilities. The 2015 PET kit costing $435, includes a membrane filtration unit and incubator with an option of testing for enterococci or E. coli powered by solar-charged batteries. Comparative laboratory testing using diluted stock culture of E. faecalis and environmental field testing (freshwater/saltwater) on mEI agar was conducted to establish the accuracy of the PET, and has shown comparable recovery to standard laboratory methods. Results indicated no significant statistical difference between the two methods with p-values indicating a strong correlation of data. Future work includes additional E. coli testing and development of design requirements to allow for open sourcing of equipment.

Awards Won:
Fourth Award of $500